

REMARKS

Claims 21-40 are pending in the application. This Amendment currently amends claims 23-28 and adds new claims 33-40. No new matter is added to currently amended claims 23-28 or to new claims 33-40.

Notwithstanding any claim amendments of the present Amendment or those amendments that may be made later during prosecution, Applicants' intent is to encompass equivalents of all claim elements. Reconsideration in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 21-32 stand rejected under 35 U.S.C. §112, first paragraph.

Claims 21-24 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 5,985,697 to Bowers et al. (hereinafter, Bowers). Claims 25 and 26 stand rejected under 35 U.S.C. §103(a) as unpatentable over Bowers in view of U.S. Patent No. 5,557,115 to Shakuda. Claims 27 and 32 stand rejected under 35 U.S.C. §103(a) as unpatentable over Bowers in view of U.S. Patent No. 5,537,433 to Watanabe. Claims 28-31 stand rejected under 35 U.S.C. §103(a) as unpatentable over Bowers in view of U.S. Patent No. 5,977,565 to Ishikawa et al. (hereinafter, Ishikawa).

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention is directed to *inter alia* a method of manufacturing a light-emitting device that comprises forming a light-emitting layer comprised of $\text{In}_x\text{Ga}_{1-x}\text{N}$ on a sapphire substrate, in which the light-emitting layer has an indium mole fraction X and emits light of wavelength (nm) = $1239.8/E_g$ (eV), such that the emitted light has an energy level $E_g < (3.4 * (1-X)) + (1.95 * X) - (1.0 * X * (1-X))$, the light-emitting layer being devoid of an intentional impurity.

II. THE 35 U.S.C. §112, FIRST PARAGRAPH, REJECTION

The Office Action rejects claims 21-32 under 35 U.S.C. §112, first paragraph, and asserts that in claim 21, "said light-emitting layer being devoid of an intentional impurity" is not disclosed in the specification.

Page 3, line 15 to page 4, line 2 of the application recites:

"The solid line in Fig. 1 that shows the newly discovered relationship is characterized by a line more sharply inclined than the one-dot chain line in Fig. 1, which shows the conventionally proposed relationship. A conceivable reason therefor is that since the lattice constant of a semiconductor constituting the light-emitting layer is different from that of the sapphire substrate, the light emitting-layer is distorted, and as a result, the photon energy is decreased, i.e., the wavelength is shifted toward long wavelengths even if the indium mole fractions are the same.

The relationships shown in Fig. 1 illustrate cases where light-emitting layers are formed of $\text{In}_x\text{Ga}_{1-x}\text{N}$ with no intentional impurities contained."

Applicants respectfully submit that the above recitation from the application clearly provides support for the phrase "said light-emitting layer being devoid of an intentional impurity" of claim 21. Withdrawal of the rejection of claims 21-32 under 35 U.S.C. §112, first paragraph, is respectfully solicited.

III. THE PRIOR ART REJECTIONS

A. The Bowers Reference

The Examiner admits that "[a]lthough, Bowers et al. do not disclose the well layers [allegedly analogous to the light-emitting layer of the claimed invention] is devoid of an intentional impurity, but it is well known in the art that a well layer in the MQW is not doped (devoid of impurity) to create the carriers confinement region in the MQW" (Office Action, page 3, lines 9-11).

As recited in the Manual of Patent Examining Procedure (MPEP), the mere fact that references can be modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916, F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). §2143.01 Manual of Patent Examining Procedure, 8th ed.

Nowhere does Bowers teach or suggest the feature of the light-emitting layer (or its alleged analogous well layer) being devoid of an intentional impurity, as recited in claim 21. In fact, the only reference to the feature of the light-emitting layer being devoid of an intentional impurity is found in the claimed invention. Therefore, Applicants respectfully submit that the Examiner's assertion of obviousness results from impermissible hindsight reconstruction by which the Examiner cannot establish a *prima facie* case of obviousness

under 35 U.S.C. §103(a).

Applicants respectfully submit that Bowers is an improper reference to establish a *prima facie* case of obviousness for claim 21 under 35 U.S.C. §103(a) because the proposed modification to Bowers suggested by the Examiner is not taught or suggest anywhere within Bowers and that proposed modification may only result from impermissible hindsight reconstruction. Claims 22-24 depend from claim 21. Therefore, the rejection of claims 21-24 under 35 U.S.C. §103(a) over Bowers is also improper. Withdrawal of the rejection of claims 21-24 under 35 U.S.C. §103(a) as unpatentable over Bowers is respectfully solicited.

B. The Shakuda Reference

Shakuda discloses, "the $\text{In}_{0.15}\text{Ga}_{0.85}\text{N}$ light emitting layer 5 contains zinc (Zn) as an additive." (col. 4, lines 25-27)

Claim 21 recites at least the features of "wherein the light-emitting layer has an indium mole fraction X and emits light of wavelength (nm) = $1239.8/E_g$ (eV), such that the emitted light has an energy level $E_g < 3.4 * (1-X) + 1.95 * X - 1.0 * X * (1-X)$, said light-emitting layer being devoid of an intentional impurity."

Zinc (Zn) is an intentional impurity added to the $\text{In}_{0.15}\text{Ga}_{0.85}\text{N}$ light emitting layer 5 of Shakuda to increase the wavelength of emitted light. Therefore, Shakuda does not teach or suggest "said light-emitting layer being devoid of an intentional impurity," as recited in claim 21.

As stated above in regard to the rejection of claims 21-24 under 35 U.S.C. §103(a) over Bowers, the Examiner admits that "Bowers et al. do not disclose the well layers is devoid of an intentional impurity." As argued directly above, Shakuda also does not teach or suggest "said light-emitting layer being devoid of an intentional impurity."

For at least the reasons outlined above, Applicants respectfully submit that Bowers and Shakuda, either individually or in combination, do not disclose every feature of claim 21. Accordingly, Bowers and Shakuda, either individually or in combination, fail to render obvious the subject matter of claim 21 and claims 25 and 26, which depend from claim 21, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 25 and 26 under 35 U.S.C. §103(a) as unpatentable over Bowers in view of Shakuda is respectfully solicited.

C. The Watanabe Reference

Fig. 15 of Watanabe shows a cross-sectional view of an AlGaIn type LED including an AlN buffer layer 301, an n-type GaN cladding layer 302, an n-type GaInN light-emitting layer 303, a p-type GaN cladding layer 304 and a p-type AlGaIn total reflection layer 305 that are formed on a sapphire substrate 300 in order, by the MOCVD method (col. 14, lines 20-27).

Claim 21 recites at least the features of "wherein the light-emitting layer has an indium mole fraction X and emits light of wavelength (nm) = $1239.8/E_g$ (eV), such that the emitted light has an energy level $E_g < 3.4 * (1-X) + 1.95 * X - 1.0 * X * (1-X)$, said light-emitting layer being devoid of an intentional impurity."

Watanabe does not cure the deficiencies of Bowers. Nowhere does Watanabe teach or suggest "said light-emitting layer being devoid of an intentional impurity," as recited in claim 21.

As stated above in regard to the rejection of claims 21-24 under 35 U.S.C. §103(a) over Bowers, the Examiner admits that "Bowers et al. do not disclose the well layers is devoid of an intentional impurity." As argued directly above, Watanabe also does not teach or suggest "said light-emitting layer being devoid of an intentional impurity."

For at least the reasons outlined above, Applicants respectfully submit that Bowers and Watanabe, either individually or in combination, do not disclose every feature of claim 21. Accordingly, Bowers and Watanabe, either individually or in combination, fail to render obvious the subject matter of claim 21 and claims 27 and 32, which depend from claim 21, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 27 and 32 under 35 U.S.C. §103(a) as unpatentable over Bowers in view of Watanabe is respectfully solicited.

D. The Ishikawa Reference

Ishikawa discloses a semiconductor light emitting diode having an n-type GaN semiconductor layer, a GaN-based active layer and a p-type GaN-based semiconductor layer on a sapphire substrate, in which the cathode is formed on the n-type GaN semiconductor layer and an electrode wiring extends from the top of the p-type GaN-based semiconductor layer to from a capacitor (Abstract, lines 1-10).

Claim 21 recites at least the features of "wherein the light-emitting layer has an

indium mole fraction X and emits light of wavelength $(nm) = 1239.8/E_g (eV)$, such that the emitted light has an energy level $E_g < 3.4 * (1-X) + 1.95 * X - 1.0 * X * (1-X)$, said light-emitting layer being devoid of an intentional impurity."

Ishikawa does not cure the deficiencies of Bowers. Nowhere does Ishikawa teach or suggest "said light-emitting layer being devoid of an intentional impurity," as recited in claim 21.

As stated above in regard to the rejection of claims 21-24 under 35 U.S.C. §103(a) over Bowers, the Examiner admits that "Bowers et al. do not disclose the well layers is devoid of an intentional impurity." As argued directly above, Ishikawa also does not teach or suggest "said light-emitting layer being devoid of an intentional impurity."

For at least the reasons outlined above, Applicants respectfully submit that Bowers and Ishikawa, either individually or in combination, do not disclose or suggest every feature of claim 21. Accordingly, Bowers and Ishikawa, either individually or in combination, fail to render obvious the subject matter of claim 21 and claims 28-31, which depend from claim 21, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 28-31 under 35 U.S.C. §103(a) as unpatentable over Bowers in view of Ishikawa is respectfully solicited.

IV. CONCLUSION

In view of the foregoing, Applicant submits that claims 21-40, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

Serial No. 09/711,908
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The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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